

# Interdependencies of payment and settlement systems: the Hong Kong experience

*by the Financial Infrastructure Department*

Payment and settlement systems around the world have become more interdependent as a result of increasing cross-border activities and higher aversion to settlement risks. This trend has contributed to the strengthening of global financial infrastructure through the reduction of settlement risks and costs. At the same time, tightened system connections have reshaped the risk landscape and increased the potential for contagion across interrelated systems. Nevertheless, from the Hong Kong experience, system interdependencies, if properly managed, can be more beneficial than harmful. The smooth and efficient functioning of interdependent systems also plays a role in weathering regional and global financial crises. This article outlines the Hong Kong experience in the evolution of system interdependencies and the steps taken to mitigate risks arising from growing system integration.

## Introduction

As the global financial system has become more sophisticated in recent years, tighter interdependencies among payment and settlement systems have become the norm. With closer connections between various components of the global financial infrastructure, settlement flows, operational processes and risk-management procedures of one system are strongly related to those of others. Against this developing trend, the Committee on Payment and Settlement Systems (CPSS) of the Bank for International Settlements published a report in June 2008<sup>1</sup> examining the emergence of system interdependencies, identify associated challenges, and recommend actions to reinforce the benefits of system interdependencies and make the global payment and settlement infrastructure more resilient.

This article looks at the types of system interdependencies and their impact on risks, and the Hong Kong experience in the evolution of system interdependencies and the steps taken to address challenges posed by these developments.

## Types of system interdependencies

The CPSS report identifies three major types of interdependencies:

1. System-based (domestic or cross-border)  
This arises from a direct link through technical connection of systems or account relationship. A direct link is established to serve one or more of the following clearing and settlement needs:
  - delivery-versus-payment (DvP), by linking a securities settlement system with a payment system

<sup>1</sup> See CPSS, "The interdependencies of payment and settlement systems", June 2008.

- communications networks. The emergence of a commonly used service provider is usually due to the need to achieve economies of scale and network efficiency.

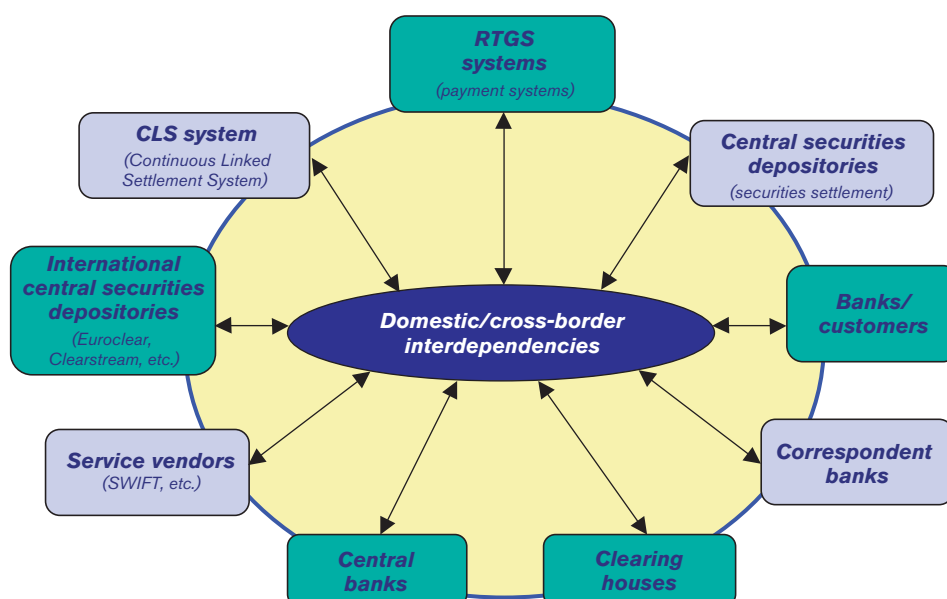
The latter two types are more difficult to identify than the first as they result from a myriad of indirect or informal relationships, potentially involving numerous systems, institutions or third parties. Diagram 1 is an illustration of the common interdependent entities involved in payment and settlement infrastructure.

## Factors contributing to system interdependencies

Several noticeable developments over the years have contributed to the evolution of system interdependencies. The increasing awareness of settlement risk, for example, has rendered DvP and Pvp settlement mechanisms increasingly common as they serve to eliminate principal risk – the risk of having paid in one currency, but receiving no financial

This refers to the dependence of multiple systems on common third-party service or infrastructure providers (such as SWIFT) and other

## Common interdependent entities in payment and settlement infrastructure



product or another currency in return. Globalisation and regionalisation entailing more cross-jurisdictional flow of goods and services have also led to increasing cross-border payment and settlement traffic. Technological development and financial innovations have made payment and settlements more efficient while helping to reduce the potential risks and costs. In addition, market consolidation has resulted in the emergence of global financial institutions playing active and multiple roles across the systems of various countries. These developments have generated the need for greater integration of payment and settlement systems in support of safe and efficient funds and securities settlement flows.

## System interdependencies and system risks

System interdependencies, out of a conscious design to provide DvP and PvP or to facilitate cross-border payments, have contributed to tighter connections between local systems and also between local and external payment and settlement systems. This helps to reduce various sources of risk, such as:

- principal risk by implementing PvP between Real Time Gross Settlement (RTGS) systems, and DvP between RTGS and securities settlement systems
- operational risk by implementing straight-through-processing between various systems
- liquidity risk by providing central-bank intraday and overnight liquidity in RTGS systems with collateral delivered through central securities depositories using DvP.

A natural concern arising from higher system interdependencies is the possibility of a domino effect if one of the systems is disrupted, because the smooth functioning of a single system is often

contingent upon the performance of one or more other systems. Disruptions in systems can develop into widespread liquidity disarray in markets, which can eventually be transmitted across financial systems. For environmental interdependencies, the widespread reliance on a common service provider is often cited as a concentration-risk concern, as there can be simultaneous failures of multiple systems caused by the failure of the service provider. While the common service provider usually has very robust risk-mitigating measures to minimise the chance of service disruptions, such concentration-risk concern still calls for interdependent entities to adapt their risk-management tools to these risks. The CPSS has made suggestions to encourage various stakeholders, for example, system operators, central banks, financial institutions and third-party service providers, to manage these new sources of risk arising from higher system interdependencies. This is critical in maintaining the resilience of the global payment and settlement infrastructure.

On balance, if properly designed and managed, system interdependencies should help to mitigate systemic risks rather than increase them.

## The Hong Kong experience

### *Increased system interdependencies*

System interdependency is one of the cornerstones of the development of Hong Kong's financial infrastructure. An important policy objective of the HKMA is to develop multi-currency, multi-dimensional platforms covering diverse financial intermediation channels including banking, equity and debt securities. To achieve this, the payment and settlement systems have been designed to facilitate domestic and cross-border transactions at both wholesale and retail levels. Over time, the various systems have evolved into an interconnected web of system links.

As shown in Diagram 2, Hong Kong's payment and settlement infrastructure network consists of three major components:

1. RTGS payment systems for money transfers in different currencies;
2. a clearing, settlement and custodian system for debt securities (the Central Moneymarkets Unit (CMU) operated by the HKMA) mainly for the primary and secondary market transactions of debt securities; and
3. system links, particularly external links, to facilitate cross-border transactions.

Through seamless system interfaces developed over the past decade, the three major components are closely tied and tightly interdependent. They serve to settle domestic and cross-border transactions for

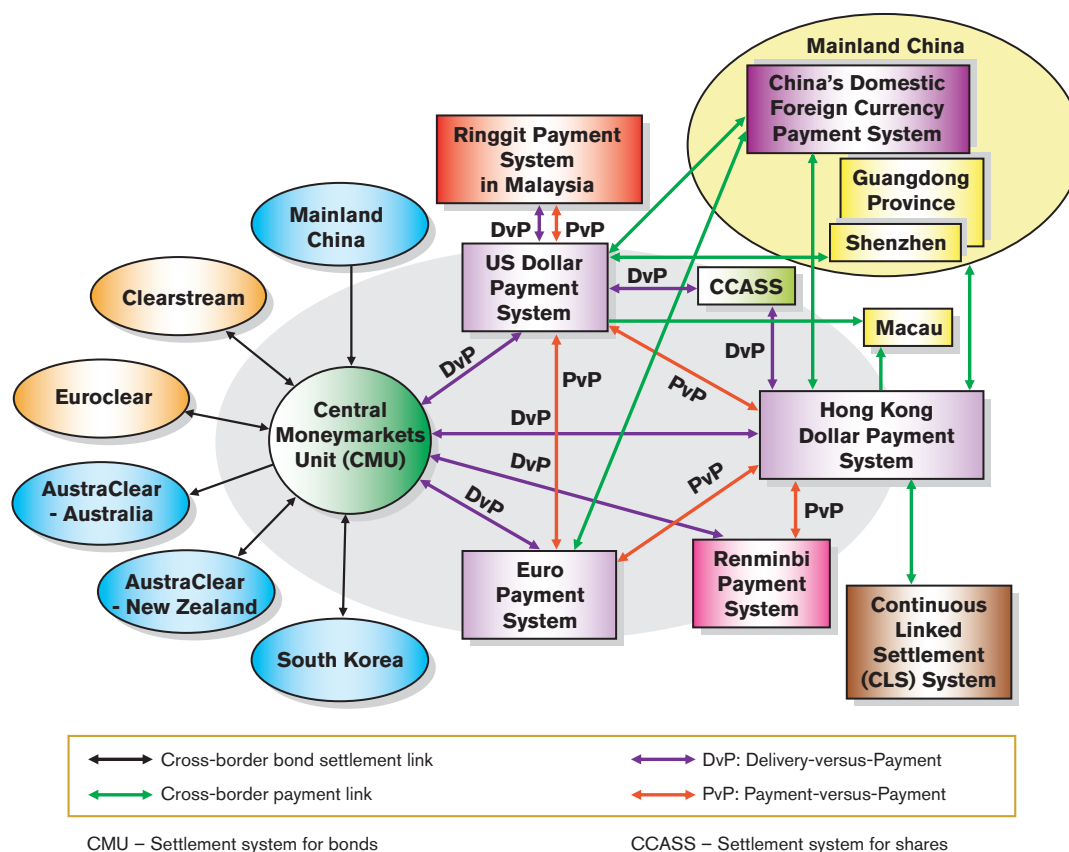
funds and securities in different currencies, forming a solid foundation for developing Hong Kong as a payment and settlement hub for the region.

### *The role of system interdependencies in the global financial crisis*

Over the years, the strong connections between the domestic and external systems have helped the payment and settlement platform in Hong Kong function safely and efficiently while reducing settlement risks. During the global financial crisis in 2008, the systems continued to function smoothly and efficiently, with no significant impact on the ability of financial institutions to meet payment and settlement obligations. Under the unusual liquidity stress prevailing in the financial crisis, the interdependencies among Hong Kong's systems enabled the CMU – a key component of the infrastructure – to function as an effective

**DIAGRAM 2**

### Overview of the payment and settlement infrastructure in Hong Kong



collateral-management system to help banks obtain liquidity from the HKMA when needed through the CMU's links with other systems. This was demonstrated by the CMU's support of the five temporary measures<sup>2</sup> adopted by the HKMA in early October 2008 to provide liquidity assistance to banks in Hong Kong in light of the increasing interbank funding pressures. Enhancements were made to the CMU to facilitate banks in Hong Kong to use a greater range of securities (including foreign securities) as collateral to obtain same-day-value funding from the HKMA through the Discount Window with tenors lengthened from overnight to three months.

The connection between the CMU and the RTGS systems in Hong Kong and international central securities depositories has been instrumental in helping to ease liquidity strains and ensure financial intermediation continues to function effectively.

The period of liquidity stress also saw increasing precautionary demands by banks for central-bank liquidity. The links among the domestic systems and external links with international central securities depositories allowed banks to lodge eligible securities with the CMU from these central securities depositories to obtain potential overnight and term liquidity under the enhanced collateral policy.

### **Risk management**

The evolving interdependency of Hong Kong's payment and settlement systems demands strong risk-management controls to address the increasing potential for disruptions that can quickly spread

across interdependent systems. Mindful of the critical importance of liquidity-risk management, the HKMA continually upgrades system features to help banks manage their intraday liquidity. The introduction of various liquidity-saving devices<sup>3</sup> – the Clearing House Automated Transfer System (CHATS) Optimiser, the RTGS Liquidity Optimiser, the Cross-currency CHATS Optimiser, the Central Clearing and Settlement System (CCASS) Optimiser and the Simultaneous Processing of DvP and Collateralisation – are among the measures introduced to help improve the efficiency of intraday liquidity management in support of increased turnover. In the same vein, the lengthening of the RTGS systems and CMU operating hours<sup>4</sup> in November 2008 provided participating banks with a longer processing window to manage their liquidity positions.

Strong business continuity arrangements help mitigate the operational risks involved in a network of tightly interconnected systems and to ensure the resilience of the infrastructure. These arrangements include live operational centres and back-up sites in different locations; back-up links with service providers and linked systems; alternate processing systems and data-transmission channels; split-team arrangements in business-continuity plans (BCP); regular reviews and updates of BCPs; and regular testing and drills.

### **Looking ahead**

System interdependencies seems likely to increase. The benefits of DvP and PvP settlement in eliminating settlement risks will encourage more systems to link

<sup>2</sup> The five temporary measures became effective on 2 October 2008 for a period of six months subject to review. The measures are: (a) expanding the eligible securities under the Discount Window; (b) extending the term of the liquidity provided through the Discount Window from overnight to maturities up to three months; (c) waiving the penalty rate for using over 50% of the Exchange Fund paper holding in accessing the Discount Window; (d) conducting foreign exchange swaps with individual licensed banks when necessary; and (e) lending term money to individual licensed banks against acceptable collaterals when necessary.

<sup>3</sup> See also "Liquidity and risk management in the RTGS system – the Hong Kong experience", *HKMA Quarterly Bulletin*, March 2008.

<sup>4</sup> Since 3 November 2008, the operating hours of the RTGS systems and the CMU in Hong Kong have been extended by an hour from 8:30 a.m. – 5:30 p.m. to 8:30 a.m. – 6:30 p.m.

with each other. In addition, cross-border movement of securities is expected to grow as a result of a greater demand for cross-border investments and the need to use foreign securities to supplement local securities to secure credit facilities from central banks and, in some cases, from commercial banks. Payment and settlement systems will need to be streamlined and linked to facilitate cross-border traffic. The basic economic driving force demands more efficient and effective financial intermediation channels – conventionally bonds and equities – resulting in the need for greater system interdependencies. At the same time, close attention will have to be paid to risks that may arise from these increasing interdependencies.

A lesson from the global financial crisis is that financial products are usually handled more efficiently with fewer contagion problems in a well-established payment and settlement system. At least, the policy makers and regulators have a better understanding of the volume involved. Looking ahead, while the two most important financial-intermediation channels are still bonds and equities, policy makers may wish to pay attention to channels which have been less thought of in the past and have not been included in formal and well-established payment and settlement systems, at least not in emerging markets. Unit trust funds are a good example.

Recently, the Depository Trust and Clearing Corporation in the US encourages the use of central counterparty in the clearing and settlement of over-the-counter (OTC) derivatives. It will be interesting to see how this transforms the trading of OTC derivatives and influences the development of system interdependencies once they are brought into a formal system for clearing and settlement. At the least, more information about the gross value of the OTC derivatives will be known to market participants than previously.